Forensic Building Science, Inc.
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St. Paul, MN 55105
T: 651.222.6509
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Date: January 22, 2018

Client: Howarth Group

Property: Rocky Waters Motor Inn
333 Parkway,
Gatlinburg, TN 37738

Dear Mr. Howarth:

This letter will serve as an interpretation with recommendations from our particulate matter sampling at the above referenced property. Air sampling and tape lift sampling was performed by Forensic Building Science (FBS) on January 4 and 5, 2018 in response to a recent brush fire.

I. Summary of Opinions

Based on the site inspection and documentation of the damages conducted by FBS, including review of the results of our soot sampling I have concluded that the property in question located at 333 Parkway, Gatlinburg, TN 37738 has been damaged by the brush fire through the deposition of soot and ash throughout the attic assemblies, interior partition walls, dropped ceilings, mechanical chase ways, light fixtures and venting. Based on the sample results, and the type of construction in the building, it is my opinion that the brush fire caused damage to the building through the deposition of carcinogenic soot into hidden wall and ceiling cavities. This soot is still viable in the ambient air as evidenced by our sampling results.

II. Sampling Results

N.G. Carlson Analytical, Inc.
216 16th Ave. S.W.
New Brighton, MN 55112 January 13, 2018

RE: Rocky Waters Motor Inn, 333 Parkway, Gatlinburg, TN 37738

Air-o-cell cassette samples (January 4, 2018 to January 5, 2018)

Location (description from chain of custody)	Trace density	Primary Particles	Notes
2– Room 102 bedroom exterior (LE) wall (30 liters)	Light	Char [<0.5] No Soot	
3 Room 104 bathroom vanity interior dividing wall (30 liters)	Moderate	Char [<0.5] Soot [1-2]	
4 Room 105 bathroom dropped ceiling (30 liters)	Very Heavy	Char [8-10] Soot [<0.5]	
5 Room 114 bedroom exterior (BE) wall (30 liters)	Light	Char [<1] No Soot	
6 Room 118 bathroom interior wall through plumbing chaseway (30 liters)	Light	Char [<1] No Soot	
7 Room 119 exterior (LE) wall (30 liters)	Light	No Char No Soot	
8 Room 125 interior wall vanity (30 liters)	Light	Char [<0.5] No Soot	
9 Room 127 interior dividing (LE) wall (30 liters)	Light	No Char No Soot	

10 Room 128 bathroom (FE) exterior wall (30 liters)	Light	Char [<0.5] No Soot	
11 – Room 136 vanity interior wall (30 liters)	Light	Char [<0.5] No Soot	Light Asp/Pen like
13 – Room 131 bathroom CMU chaseway inside dropped ceiling (30 liters)	Heavy	Char [15-20] Soot [1-2]	
14 – Attic space above Room 101 &102 ambient air (75 liters)	Moderate	Char [40-50] Soot [<1]	
17 – Attic space above rooms 116-119 ambient air (75 liters)	Heavy	Char [10-14] Soot [<0.5]	Light Asp/pen like

Char and soot like particle interpretation:

Less than 0.5 particles per field (400x) – negligible impact of smoke
0.5 and 2.0 particles per field (400x) – limited impact of smoke
2.0 and 10 particles per field (400x) – moderate impact of smoke
10 – 50 particles per field (400x) – Significant impact of smoke
> 50 particles per field TNTC – Major impact of smoke
* Several large clusters of soot-like particles noted

Tease tape samples (January 4, 2018 to January 5, 2018)

Location (description from chain of custody)	Trace density notes	Primary Particles	Notes
1 – Room 102 wood burning fire place – tape lift		**Char [20-30]** **Soot [50+]**	

12 – Room 131 fireplace - tape lift		**Char [10-20]** **Soot [50+]**	
15 – Attic space above rooms 101 &102 wood joist- tape lift		Char [2-3] No Soot	
16 – Attic space above rooms 108 &109 support beam- tape lift		Char [5-10] Soot [<1]	
18 – Attic space above Rooms 116-119 metal pipe– tape lift		Char [5-10] No Soot	

Char and soot-like particle interpretation:

Less than 0.5 particles per field (400x) - negligible impact of smoke
0.5 and 2.0 particles per field (400x) - limited impact of smoke
2.0 and 10 particles per field (400x) - moderate impact of smoke
10 - 50 particles per field (400x) - Significant impact of smoke
> 50 particles per field TNTC - Major impact of smoke
* Several large clusters of soot-like particles noted

Methods:

The Air-o-cell Cassette traces were identified under light microscopy viewed at 100x, 200x and 400x. Lacto fuchsin stain in 85% lactic acid was used to aid in identification.

No chemical identification was conducted on the soot-like, char-like particles, and carbon black-like particles. Presumptive identification was based on particle morphology.

Discussion:

Soot levels varied from not noted to major on the tease tape samples.
Char levels varied from negligible to significant on the tease tape samples.

Char levels varied from not noted to moderate on the air samples.
Soot levels varied from not noted to limited on the air samples.

Sincerely,

Neil G. Carlson, C.I.H.
N.G. Carlson Analytical, INC.

III. Sampling Discussion

Typically, in post fire remediation strategies recommended by fire restoration companies and insurance companies, walls, ceilings and floors that do not show signs of actual fire damage [e.g. char, physically burned materials] are left in place and either surfaced cleaned or repainted. Post remediation complaints from building occupants often include descriptions of a "lingering smoke smell" months and years later, particularly when large variations in temperature and humidity occur. Soot left in these cavities is "recharged" by this increase in water vapor drive from the humidity causing the smell to present.

FBS collected a total of 18 interior samples at the Rocky Water Motor Inn building. The primary purpose of the sample collection was to determine whether or not smoke soot consistent with the reported fire event is in the ceiling, wall, floor and ducting cavities, wire chase ways and other open bypass areas and assist in developing recommendations for repairs.

All the air samples were collected with an air sampling pump calibrated to run at a volume of 15 liters per minute. The sample duration varied by location. The air samples were collected with Air-O-Cell sampling cassettes.

The ambient air samples are collected for a five-minute sample period to use for comparison purposes. Tape lifts and were collected from visible surfaces where no sign of soot was viewed.

The sample locations were chosen based on my training, education and experience and the site-specific inspections and similar projects with similar failure mechanisms. All the samples were collected and entered in to a sample chain of custody. After the sampling was completed, the samples were delivered to Neil Carlson, CIH, of NG Carlson Analytical. The analysis of the results is included in the report from him.

In addition to the sample chain of custody, the locations of all the samples were written down in a site log book so that the information can be more easily viewed.

IV. Description of Soot

Definition of Soot:
Soot is a general term that refers to the black, impure carbon particles resulting from the incomplete combustion of a hydrocarbon. It is more properly restricted to the product of the gas-phase combustion process but is commonly extended to include the residual pyrolyzed fuel particles such as cenospheres, charred wood, petroleum coke, etc. that may become airborne during pyrolysis and which are more properly identified as cokes or chars. The gas-phase soots contain polycyclic aromatic hydrocarbons (PAHs). The PAHs in soot are known mutagens and probable human carcinogens. Soot is in the general category of airborne particulate matter, and as such is considered hazardous to the lungs and general health. Soot is classified as a "Known Human Carcinogen" by the International Agency for Research on Cancer (IARC).[i]

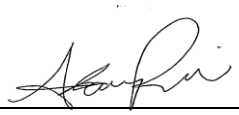
V. Conclusions

Soot and/or char was found in 16 of the 18 locations sampled [89% of the samples taken]. Generally, attic areas, mechanical chase ways in CMU block and drop ceiling areas were most affected. Some interior partition walls were also affected.

Based on the results of the sampling, all insulation should be removed from the attics, and all framing, exposed roof deck sheathing, ducting, piping and top surface of exposed upper ceiling in the attics should be cleaned by HEPA and back sprayed with BIN primer. All mechanical chase ways in CMU should be cleaned and sealed. All drop ceilings materials should be discarded and replaced. During this work, all ceiling and interior walls that are exposed during the attic work should also be cleaned and reinsulated.

All top floor ceiling lights and electrical outlets should be detached, cleaned and reset. To eliminate cross contamination removal should be done using enclosed critical containments and HEPA units.

Forensic Building Science's opinions and recommendations are made without regard to coverage. The Insurance Carrier determines coverage and any issues related to coverage are the responsibility of the Insured and the Carrier. Discovery is ongoing. Additional testing and inspections may need to be performed and additional and/or supplemental information and opinions may be contained in future reports issued by Forensic Building Science, Inc. This report is the exclusive property of the client noted previously and cannot be relied upon by a third party. Copies of this report are released to third parties only by written permission of the client.

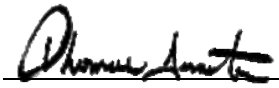


January 22, 2018

Adam Piero, Field Investigator Date

January 22, 2018

Jim Irmiter, Senior Project Consultant Date
IICRC Fire and Smoke Restoration Technician



January 22, 2018

Thomas Irmiter, President & Owner Date

[i] Reference

US Department of Health and Human Services. Public Health Service, National Toxicology Program. Report on Carcinogens, Twelfth Edition. 2011. Accessed at http://ntp.niehs.nih.gov/ntp/roc/twelfth/roc12.pdf on June 14, 2011.

Figure 01. (AP)

Figure 02. (AP)

Figure 03. Bedroom overview. (AP)

Figure 04. Living area overview. (AP)

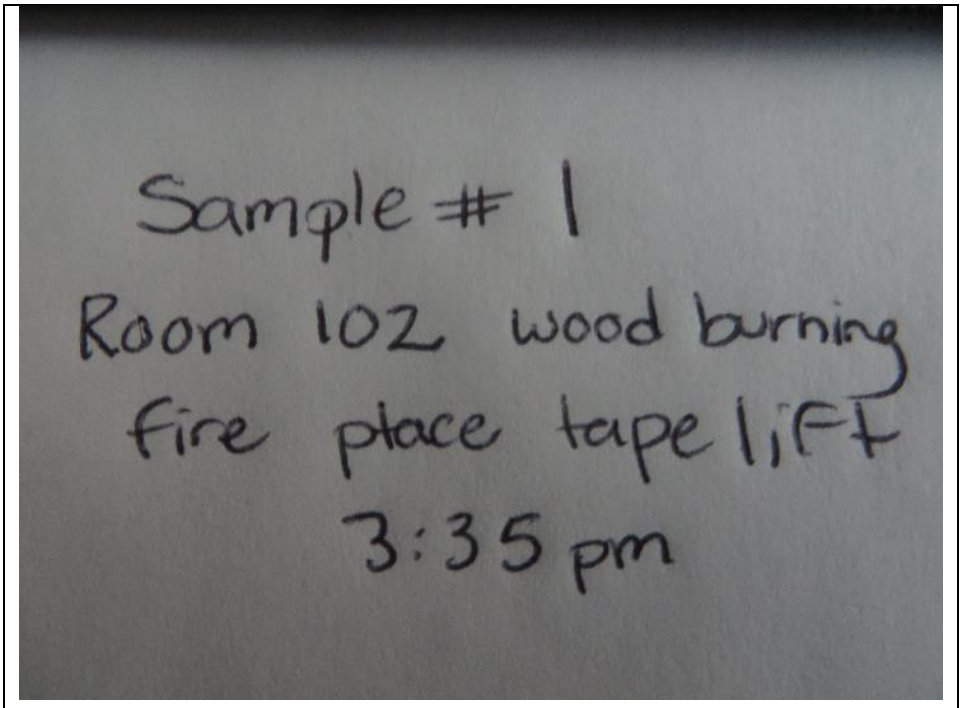


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Figure 07. For base line comparison (AP)

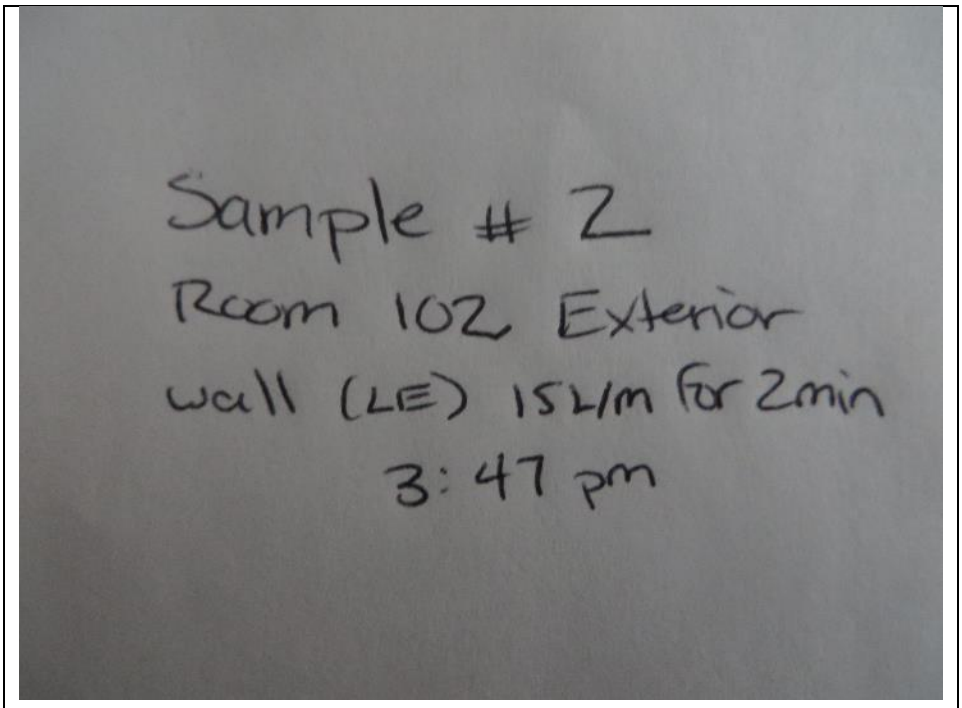

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Figure 13. Room overview. (AP)

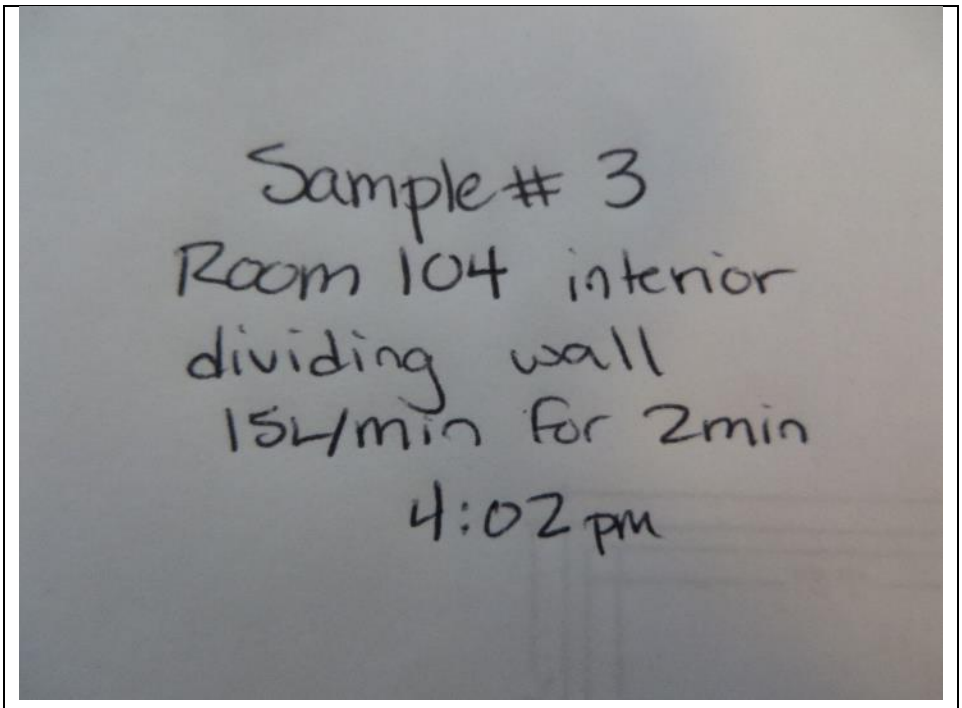

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Figure 19. Room overview. (AP)

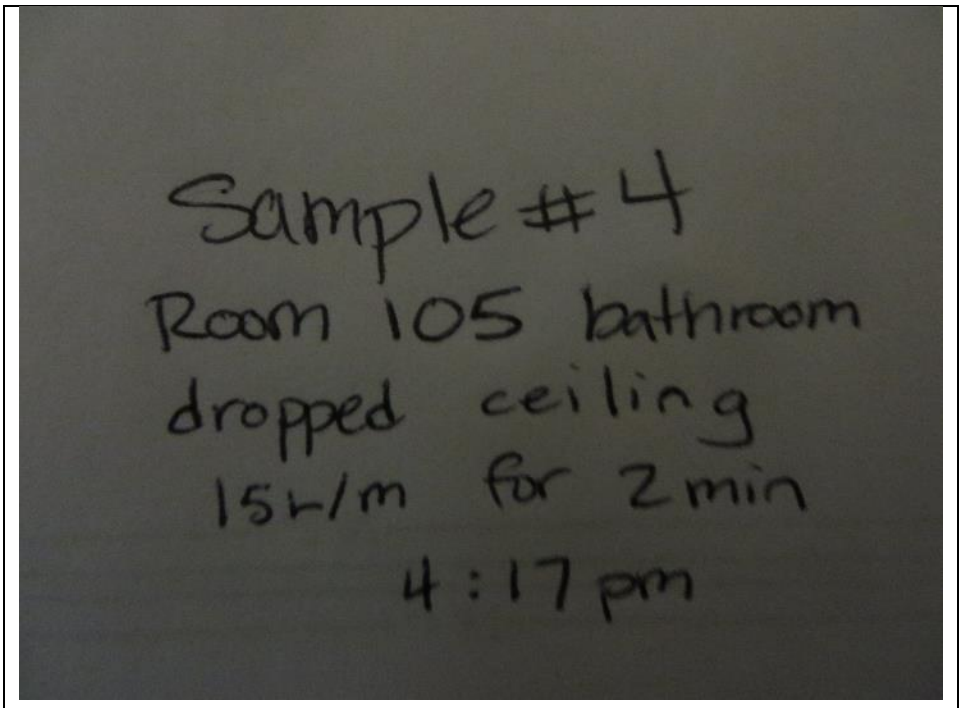

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Figure 26. Room overview. (AP)

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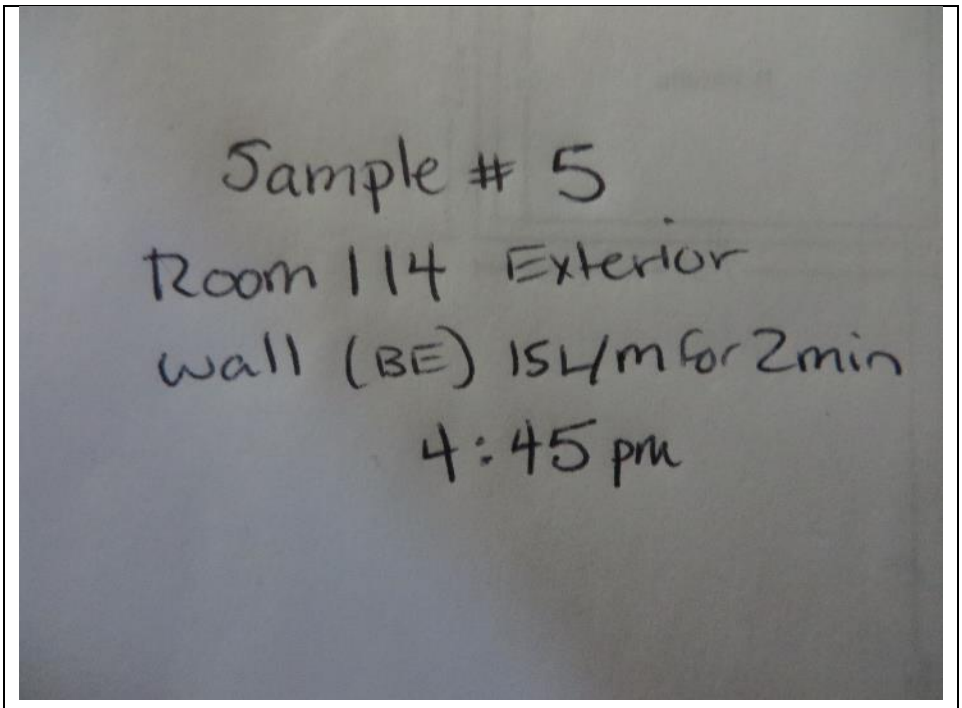

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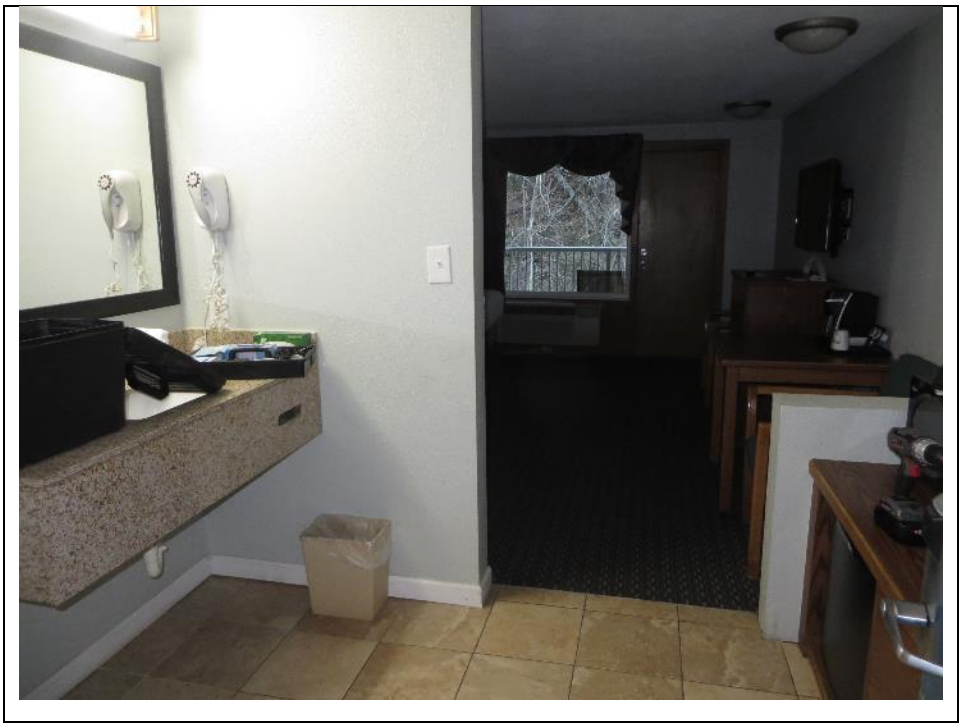

Figure 32. Room overview. (AP)

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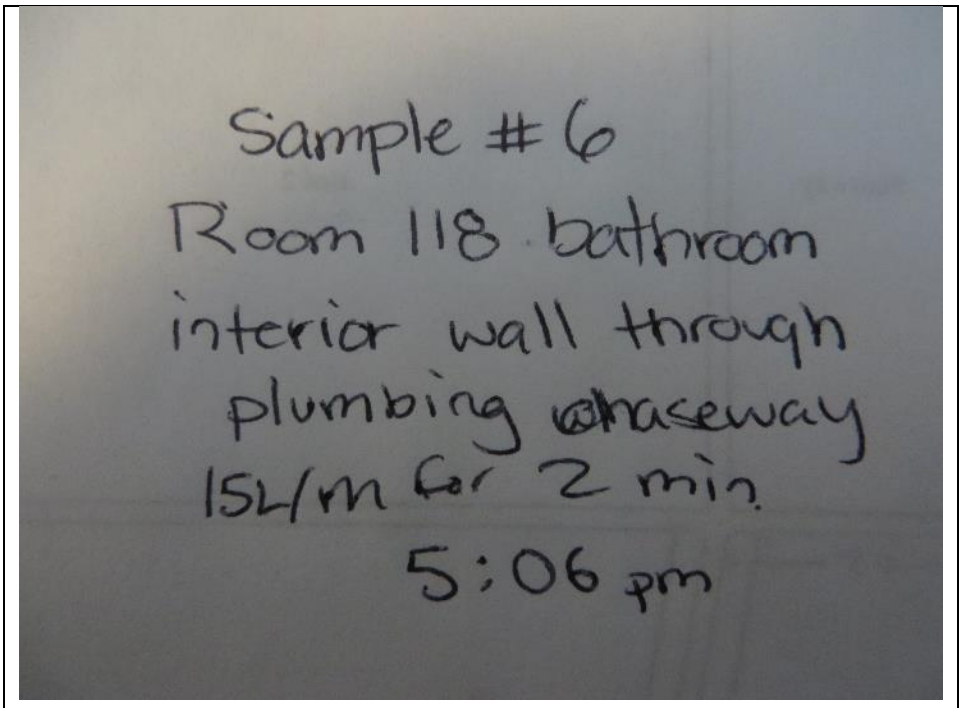

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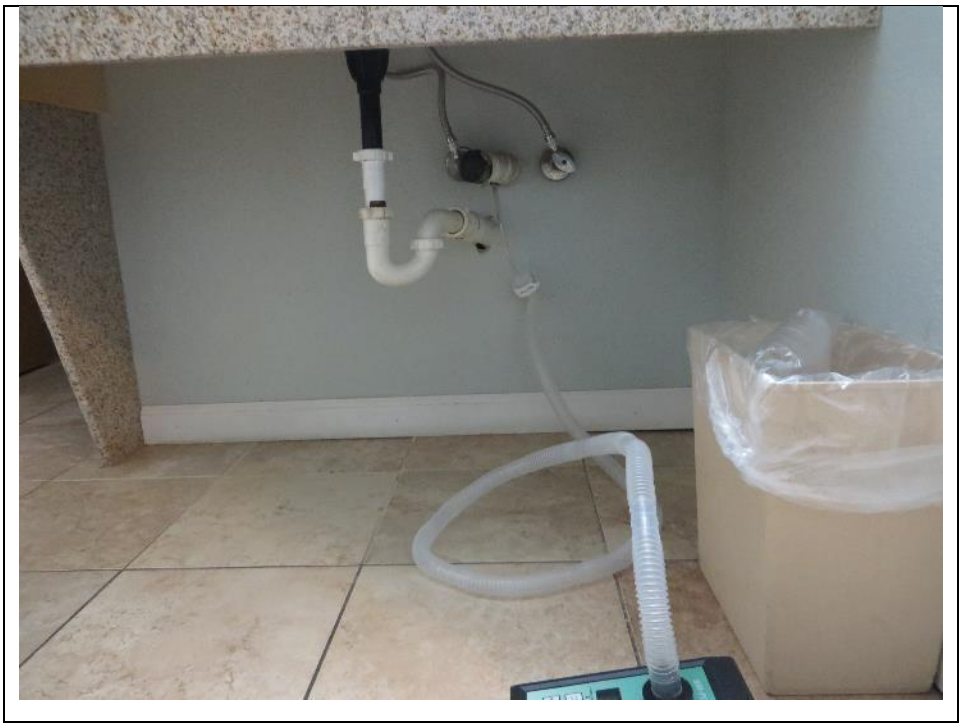

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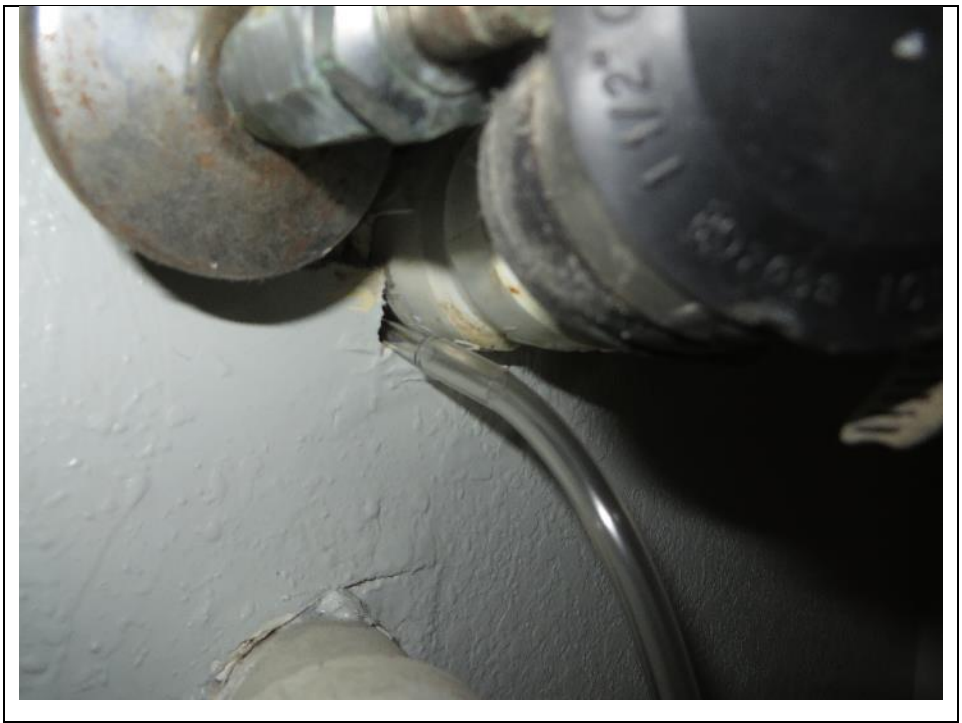

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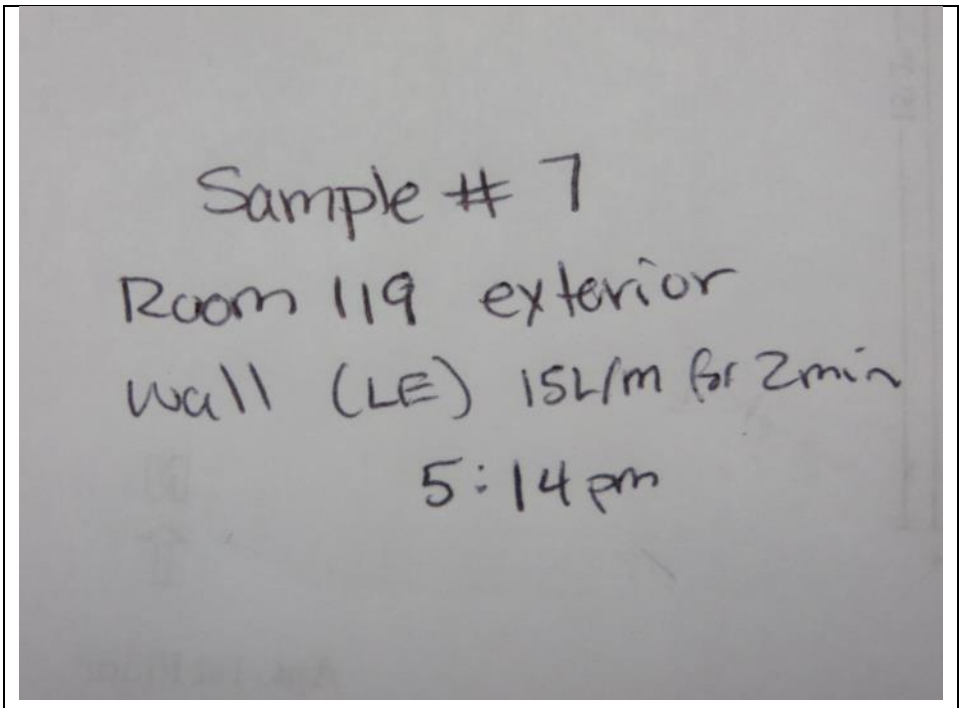

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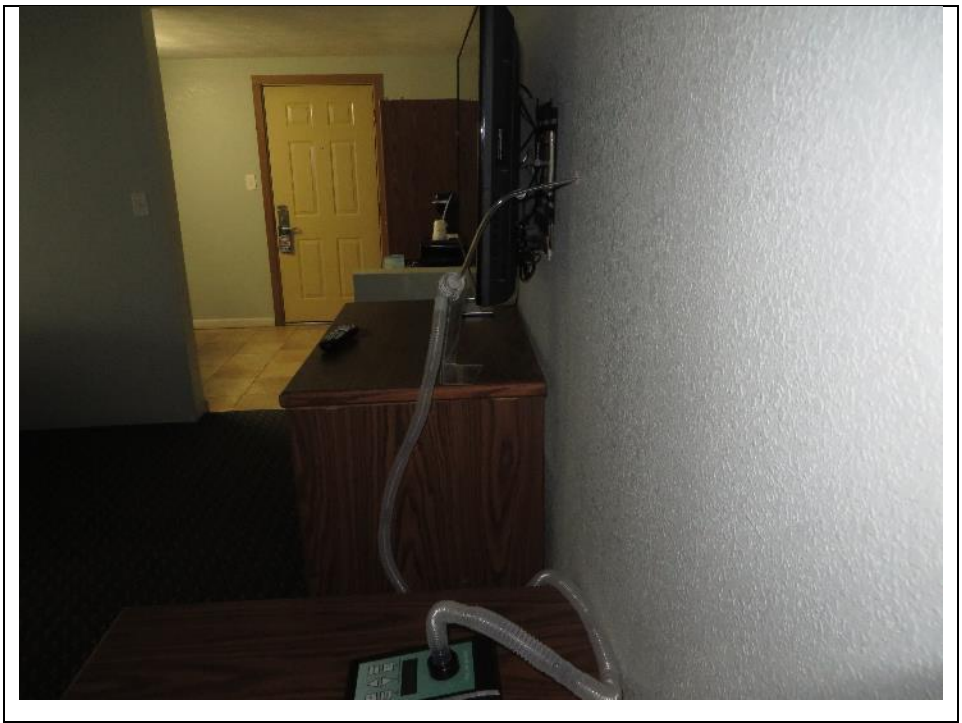

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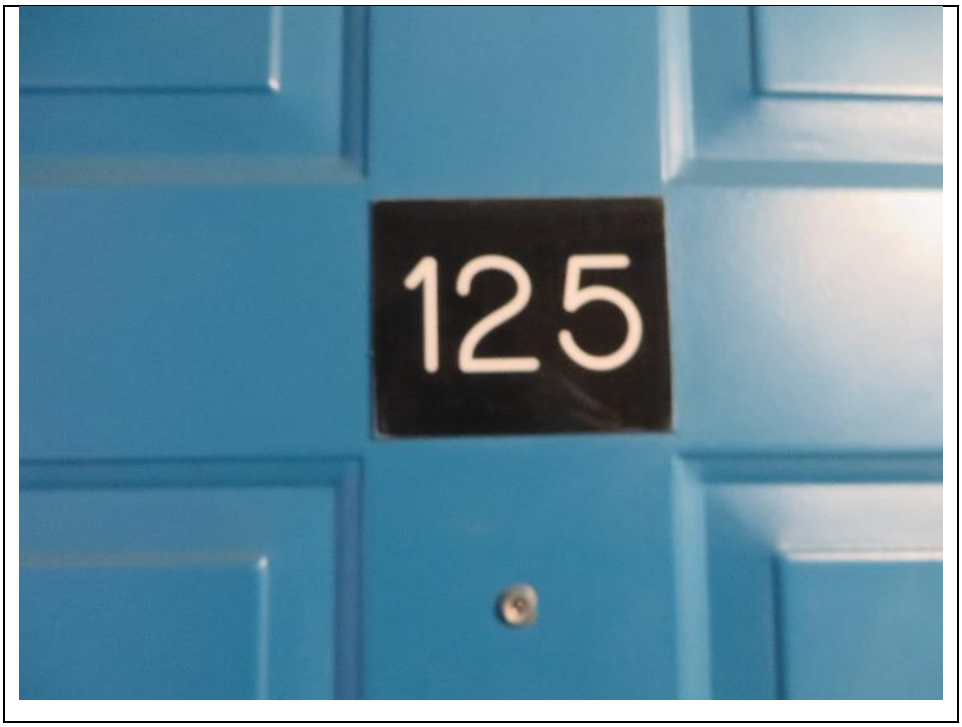

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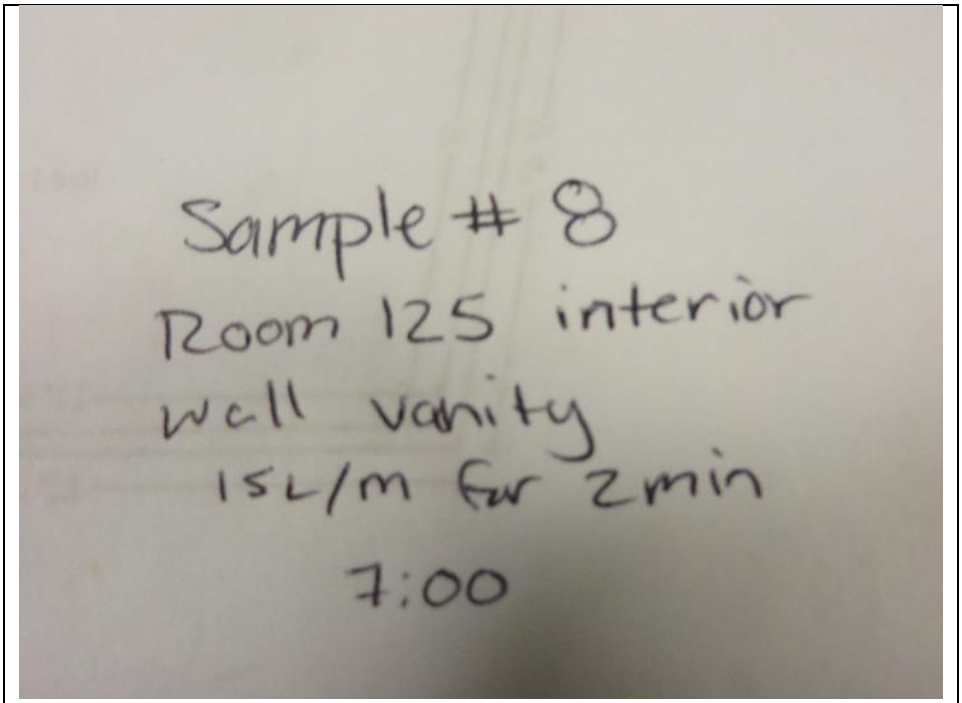

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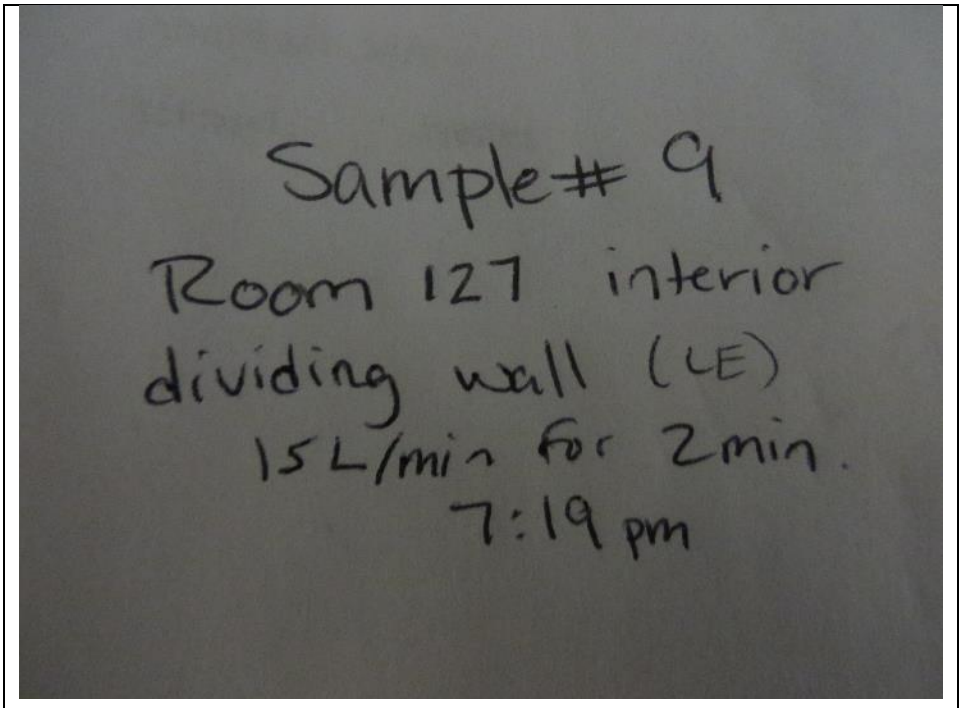
Figure 54. Room overview. (AP)



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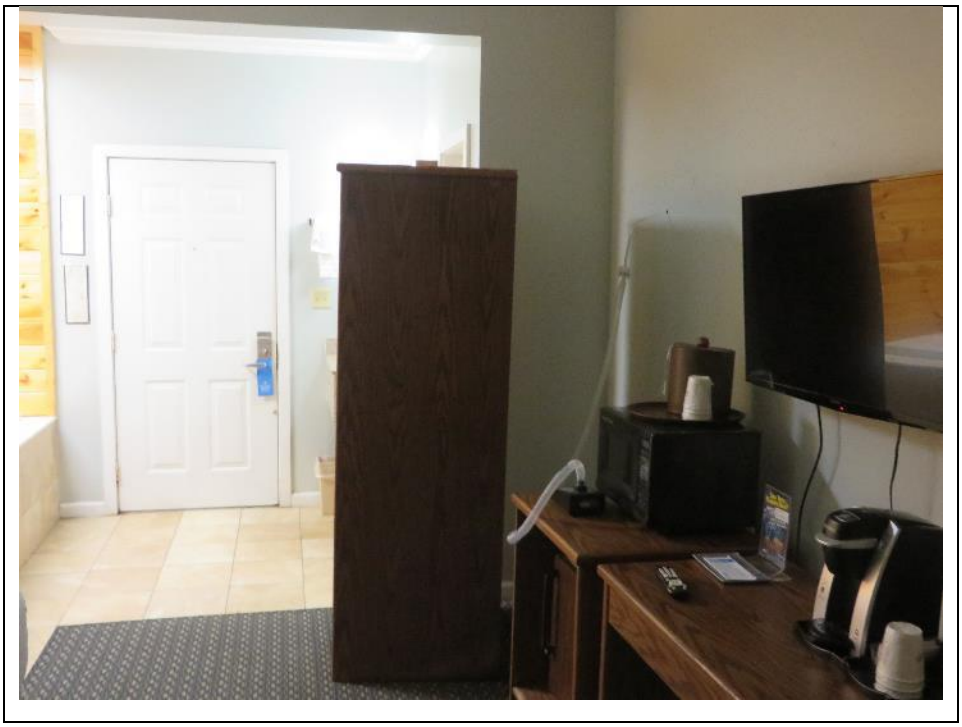

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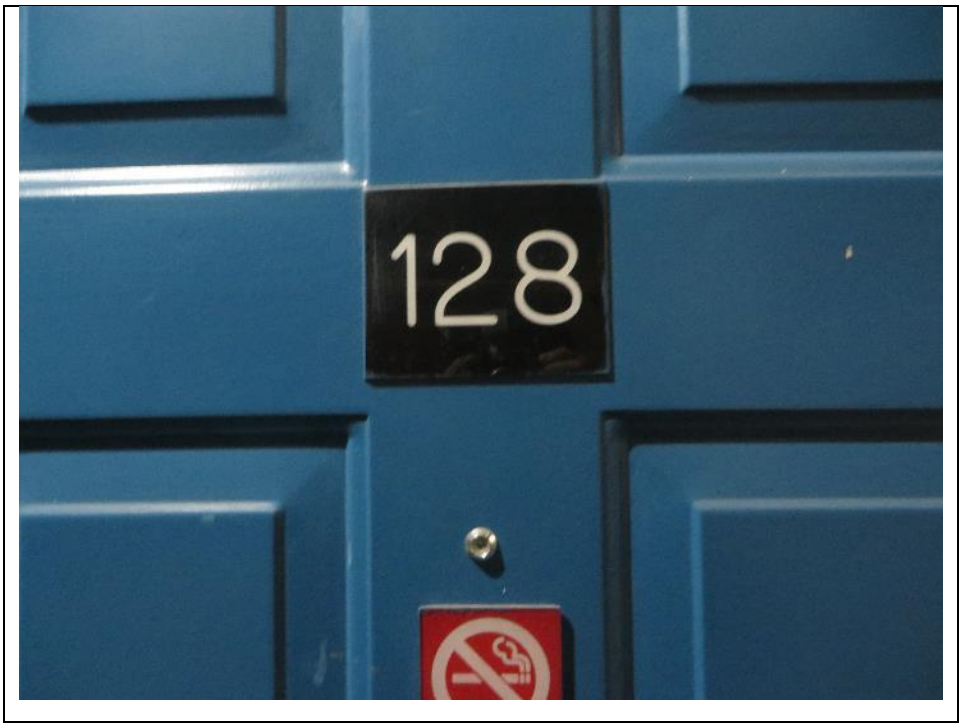

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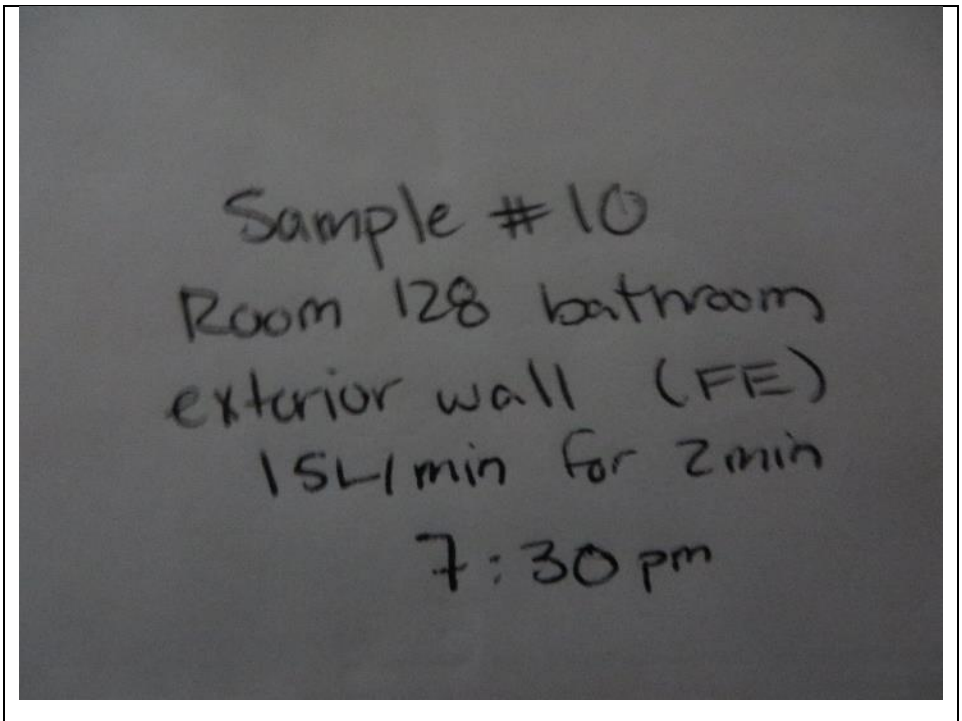
Figure 59. Room overview. (AP)

Figure 60. Bedroom overview. (AP)

Figure 61. Living area overview. (AP)



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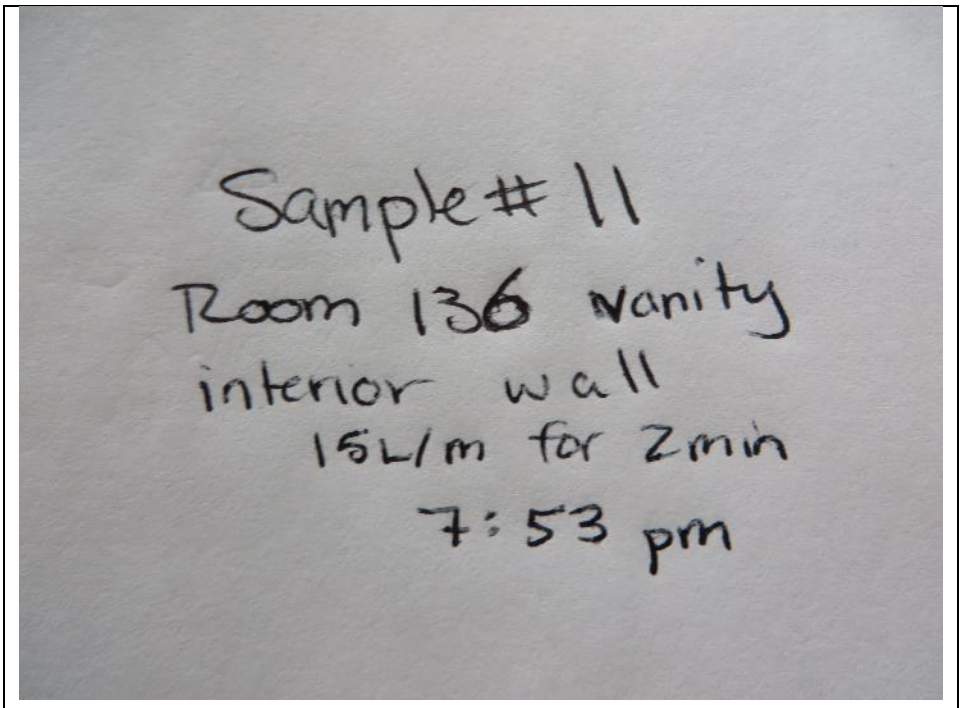

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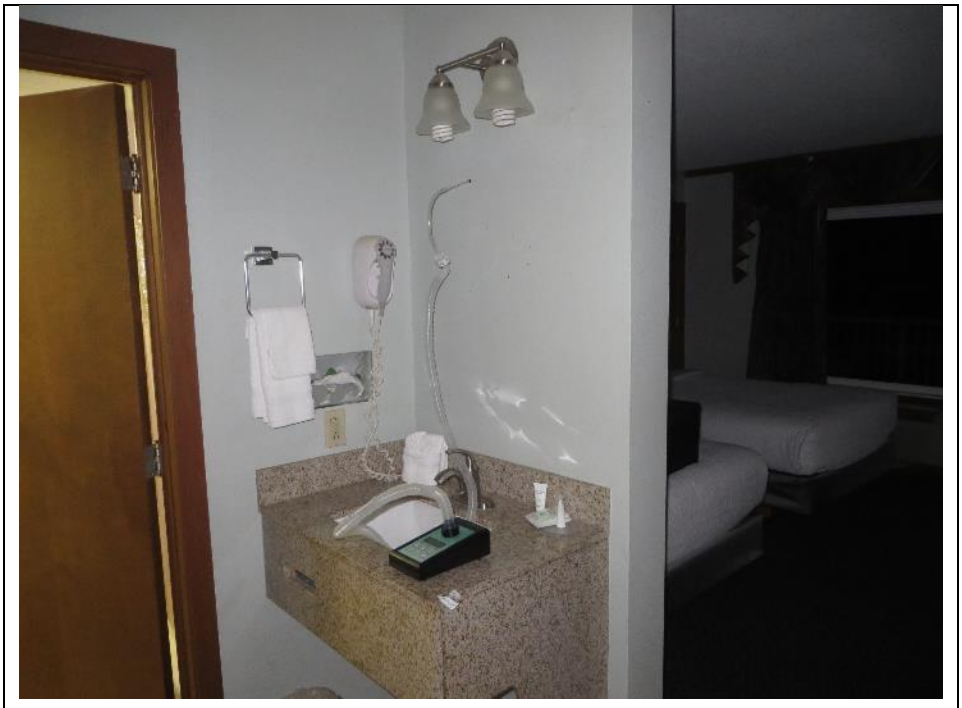

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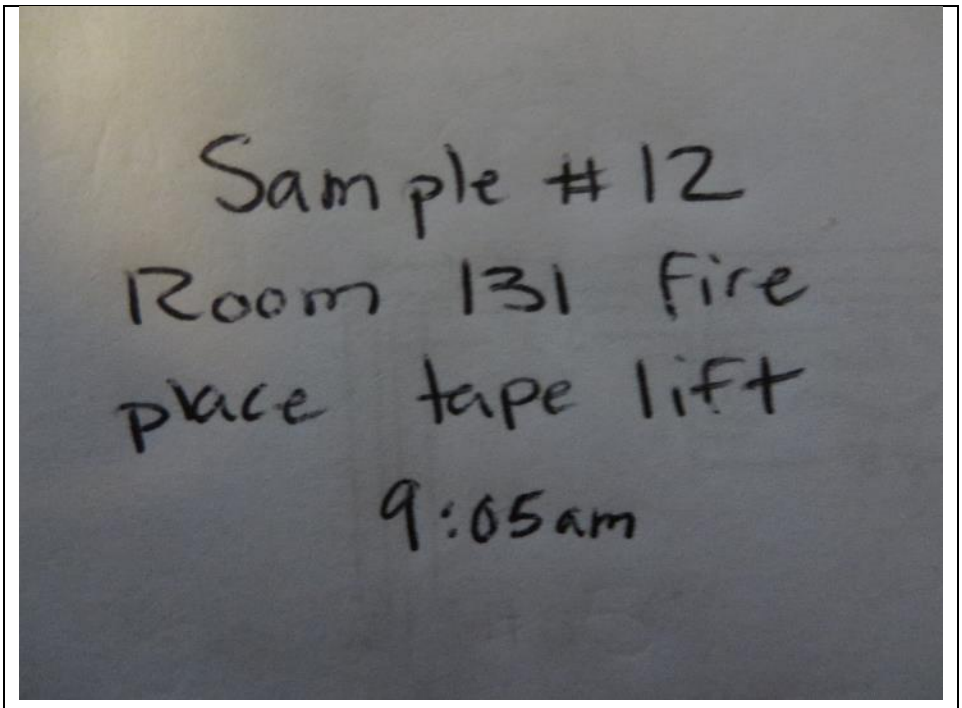

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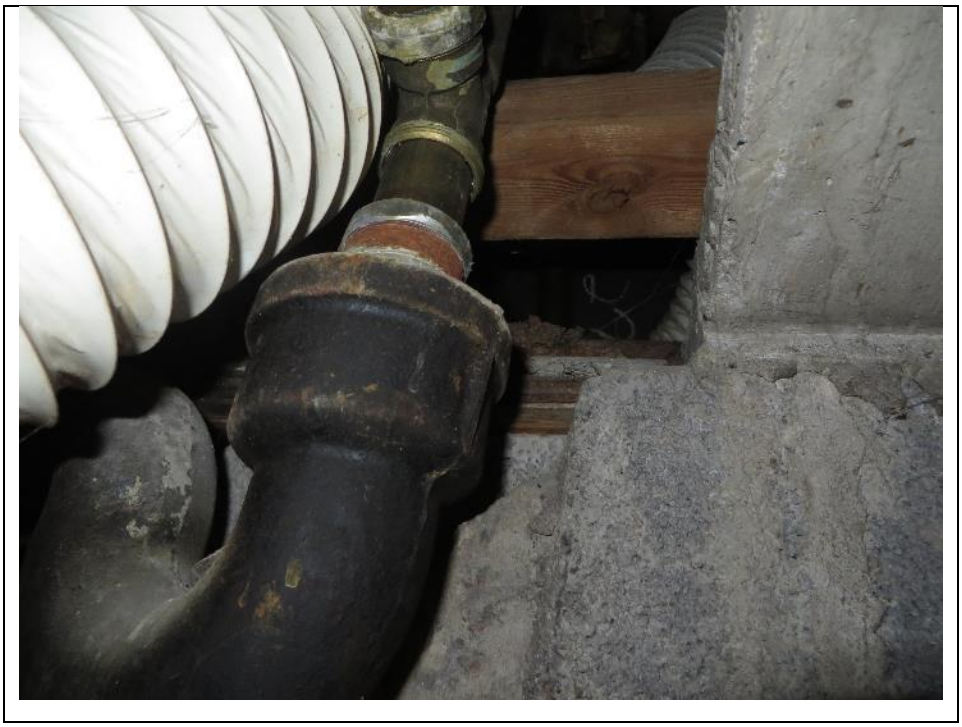

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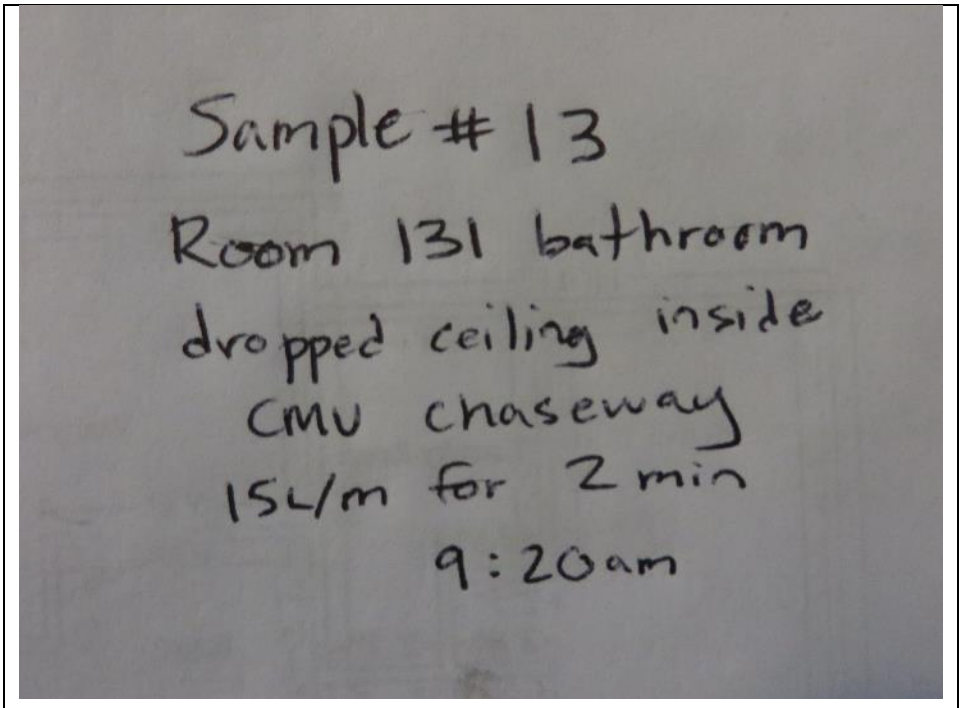

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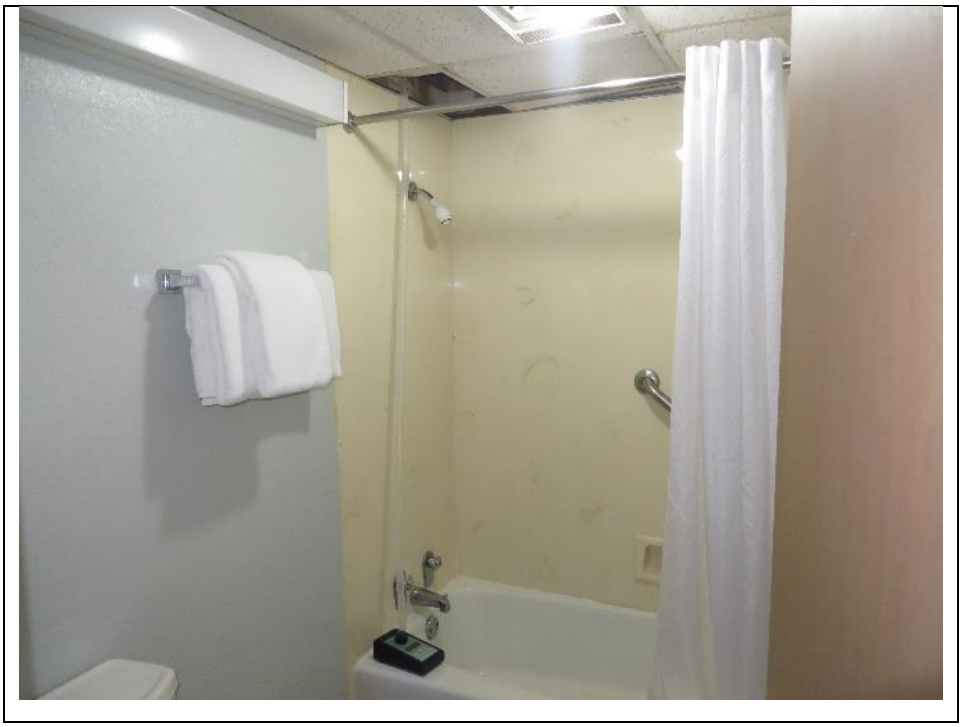

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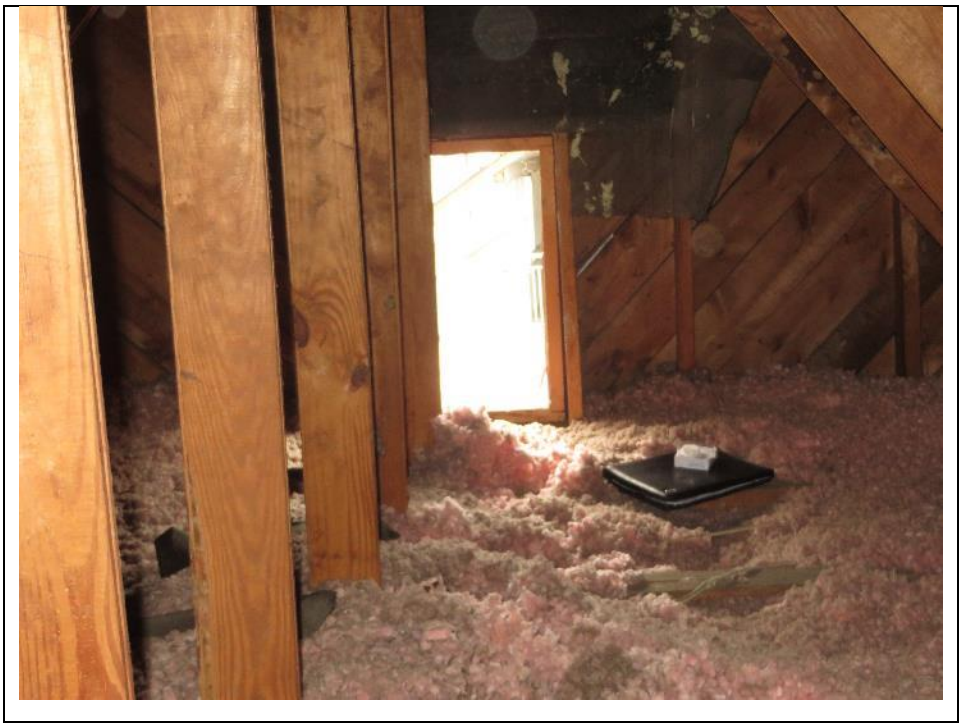
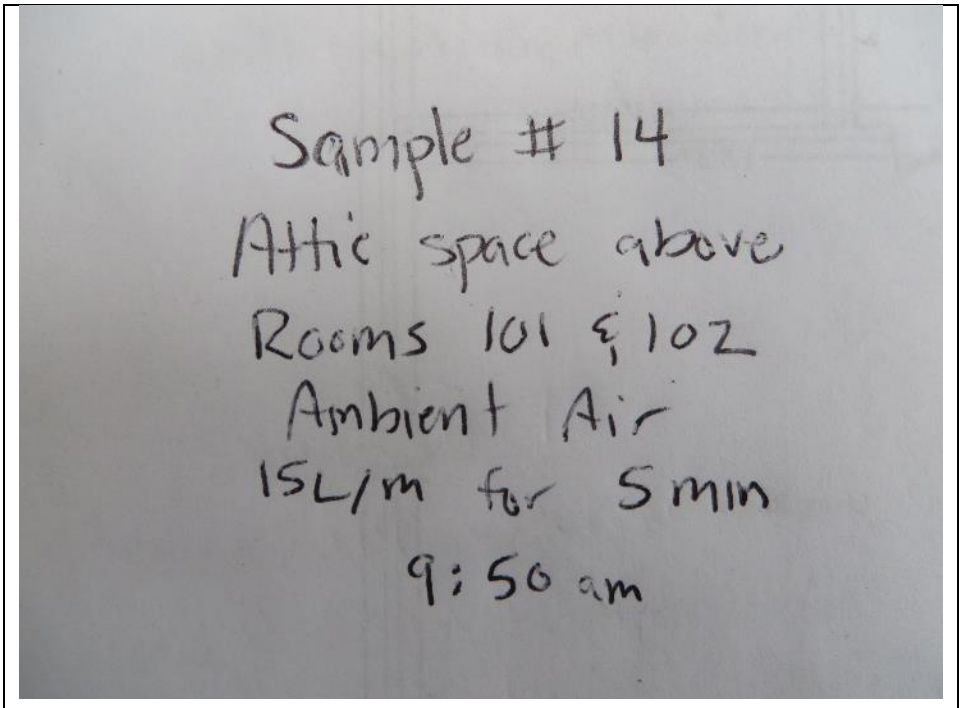


Figure 90. Attic space entry. (AP)



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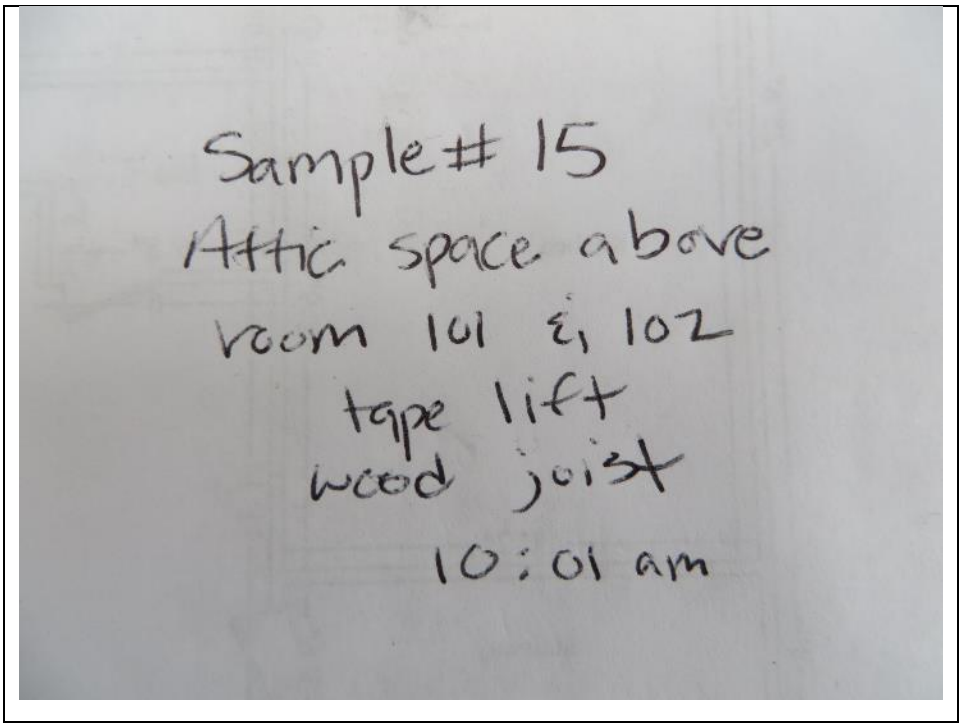

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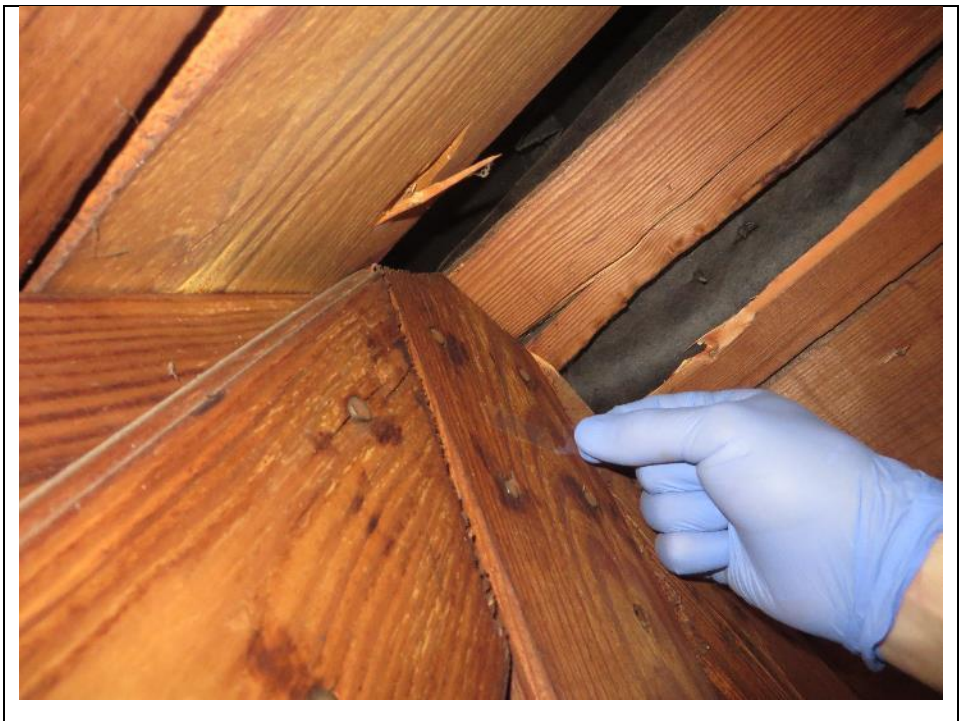


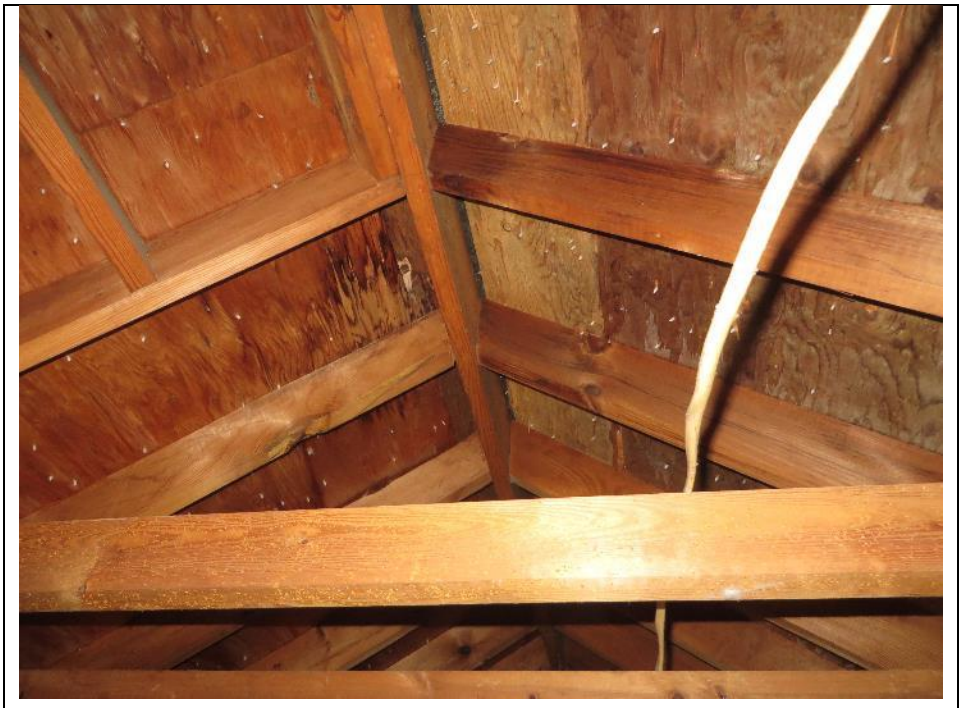
Figure 101. (AP)

Figure 102. Attic space entry. (AP)

Figure 103. Attic space overview. (AP)

Figure 104. Overview continued. (AP)

Figure 105. (AP)



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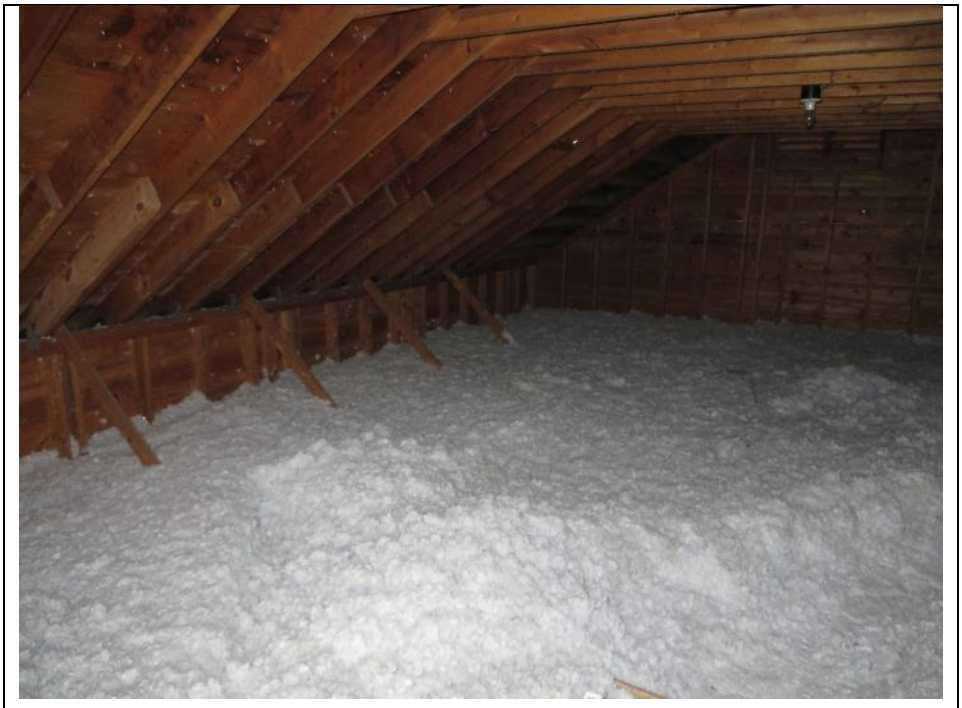

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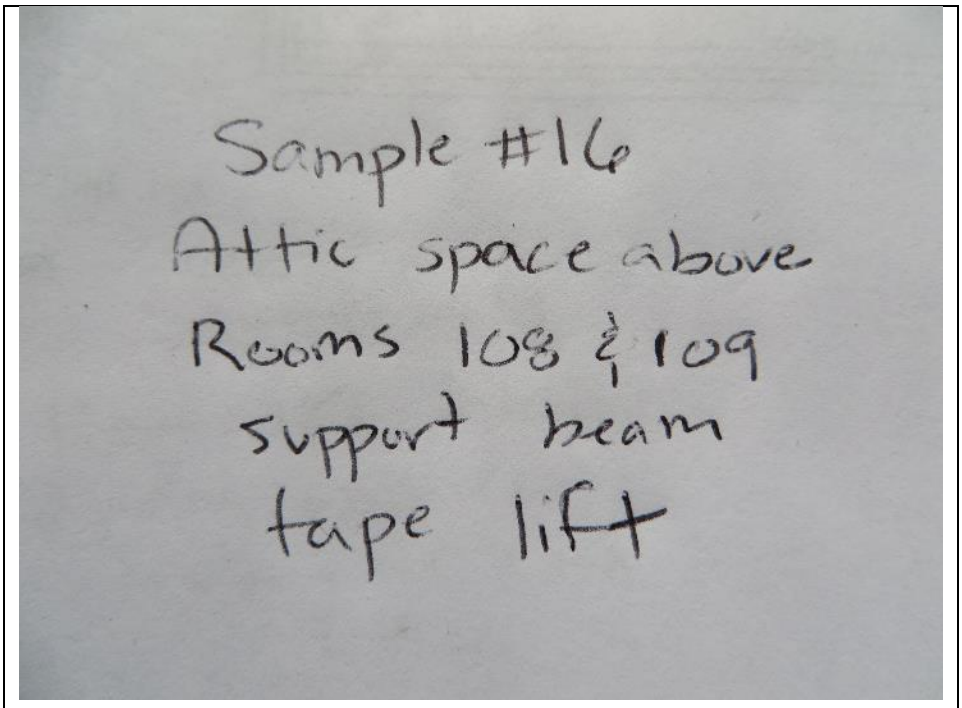

Figure 111. (AP)

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Figure 114. Attic space entry. (AP)

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Figure 116. Attic space overview. (AP)

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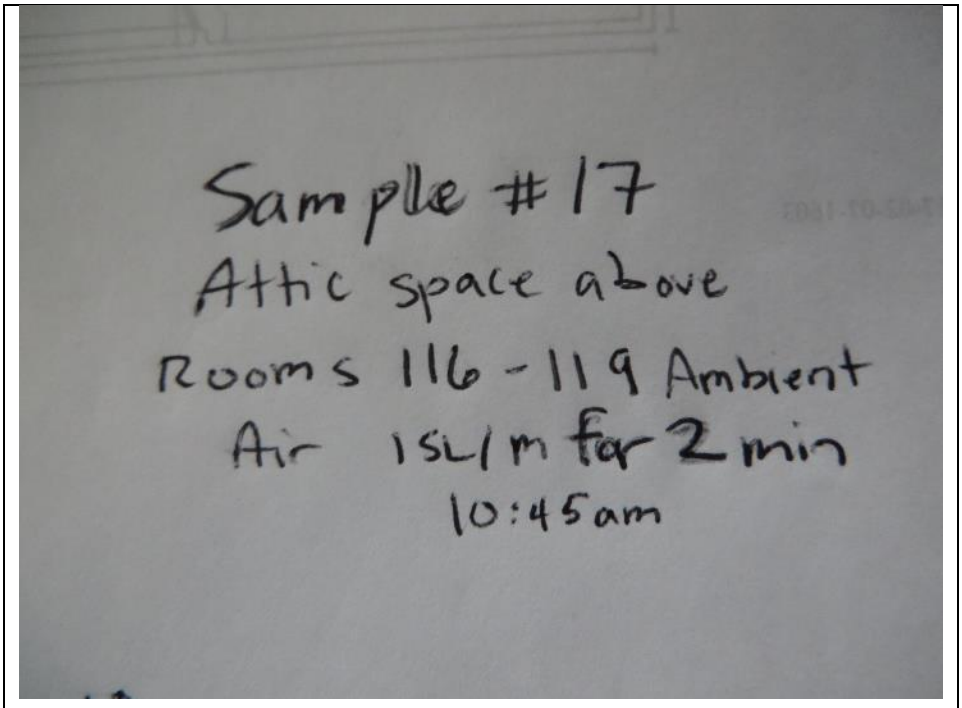

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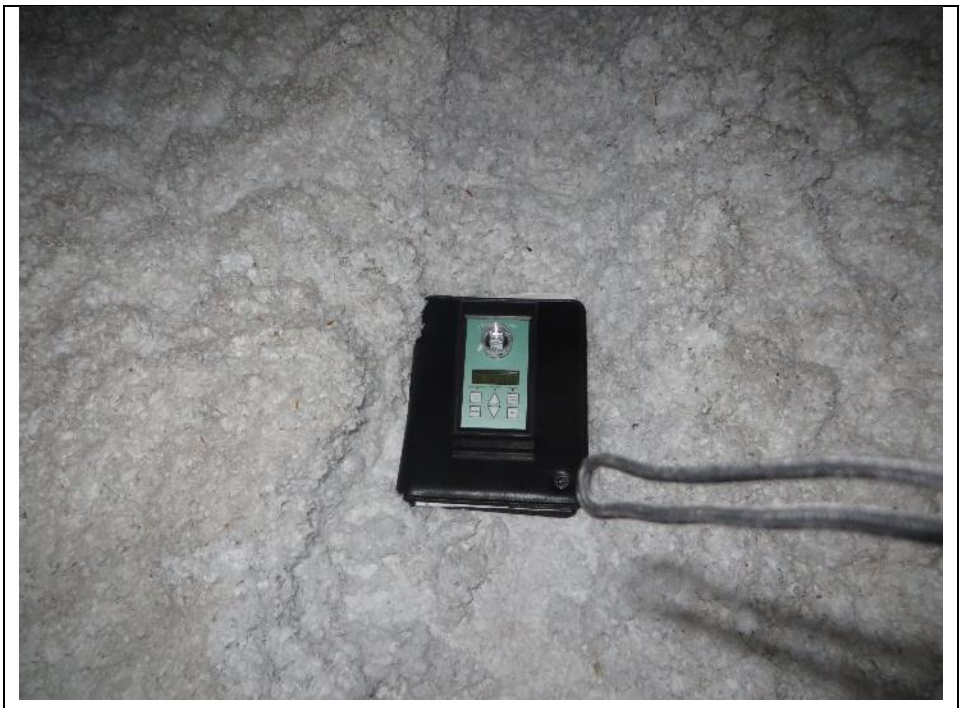

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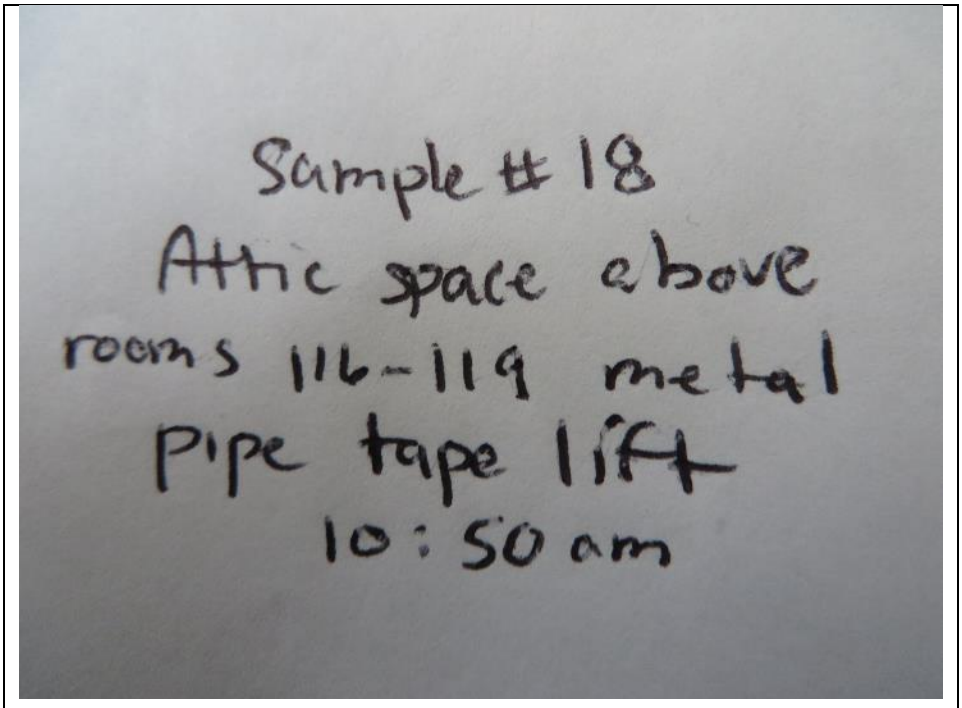

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